

# Event Builder & Level3

## — Overview for Aces —

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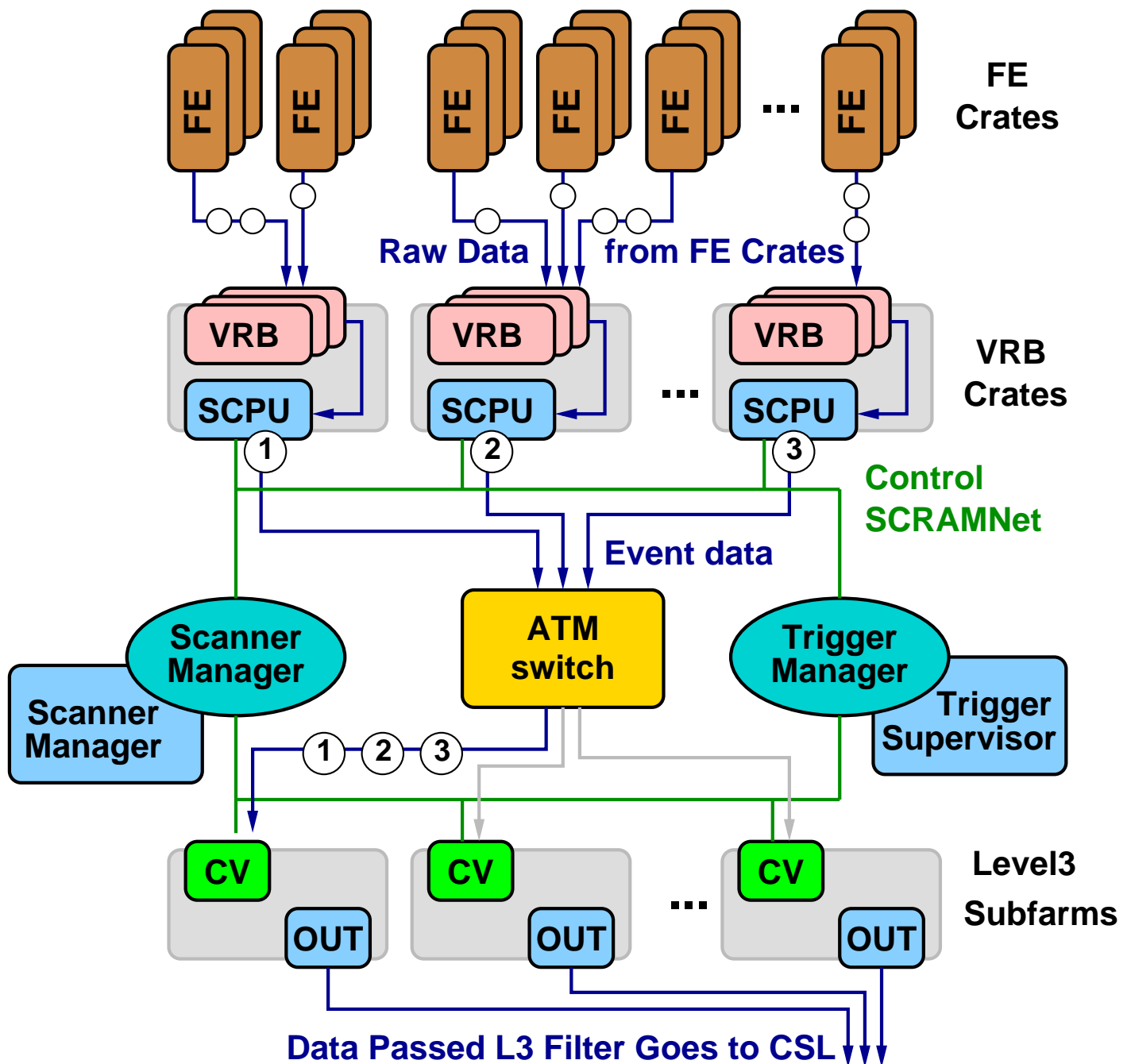
### Summary

- Introducing the EVB/L3 systems: function, layout, location
- EVB overview
- L3 overview
- Monitoring tools: Ace Control Panel, L3 Display
- Errors and recovery
- Support, documentation, people

### In three lines:

- Critical systems in the data taking (go home if either EVB or L3 do not work)
- You must have some knowledge (problems, support...), although we know that it is a complicated system
- Ask if you have questions, before being in troubles!!!

# System Overview



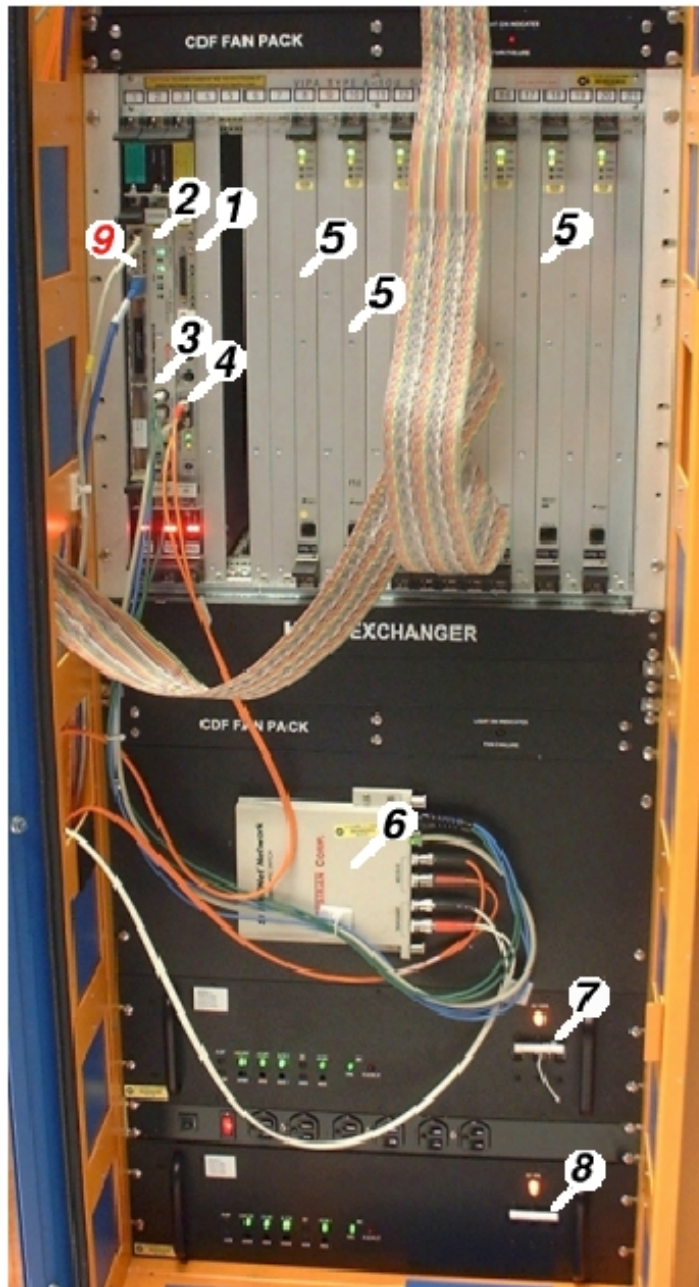
## Event Builder :

Assembles event fragments from FE crates together into a single event piece

## Level3 :

Runs executable (filter) which makes L3 trigger decision

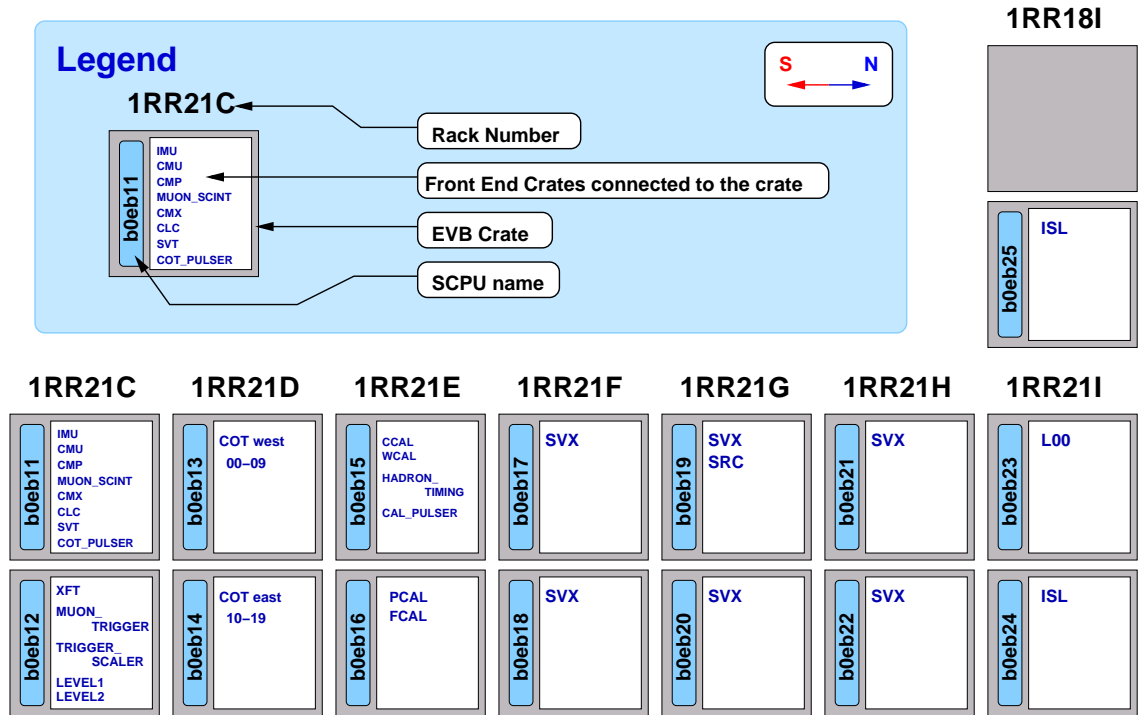
# EVB Crate Possible Actions



1. **SCPU Reset Button**
2. **ScramNet Card Lights**
3. **ScramNet Fibers**
4. **ATM Fibers**
5. **VRBs**
6. **ScramNet Bypass**
7. **Upper Crate Power Switch**
8. **Lower Crate Power Switch**
9. **Crate Reset Button**

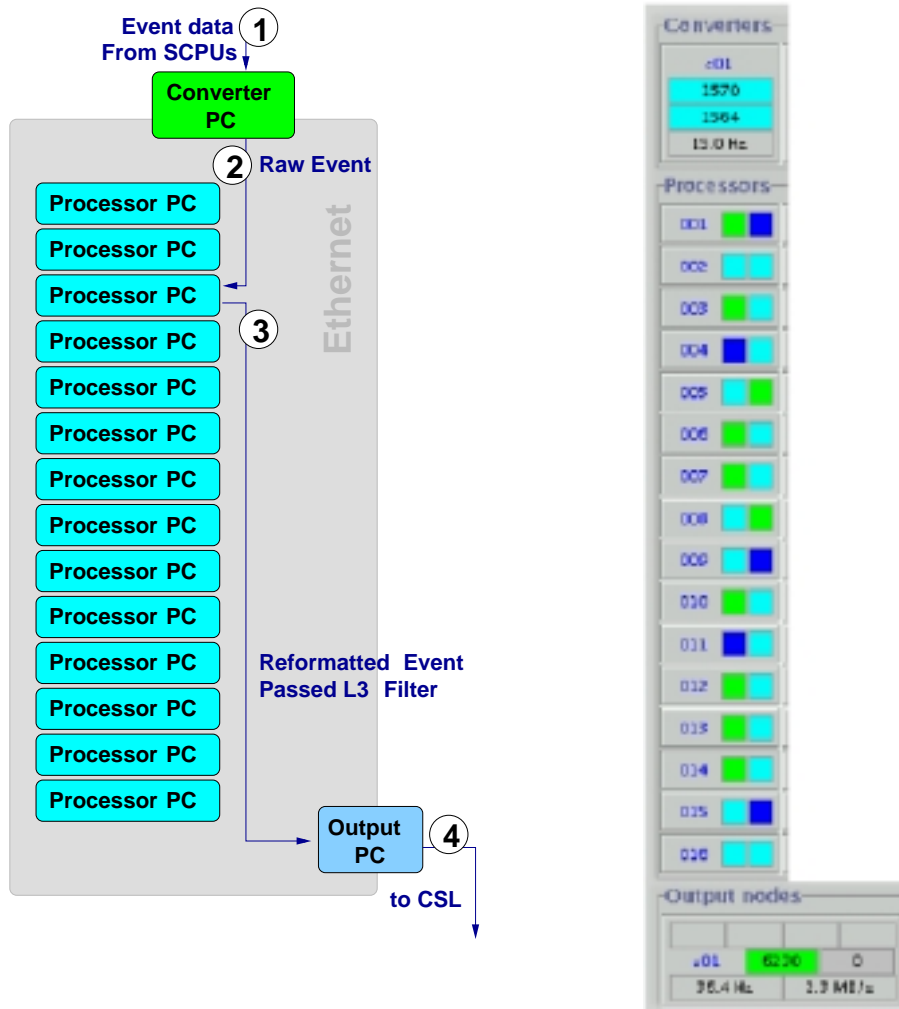
- Reboot Crate - do software reboot from control room
- Reset SCPU - push reset button on SCPU
- Reset Crate - push reset button on master board (Only if said by expert or popup window)
- Reset VRB - push reset button on VRB slot. You can not do it with your hand, you will need a pen!!!
- Powercycle the Crate - Turn the power switch off, wait for 30 sec, and turn it on. (Only if said by expert or popup window)

# Running Multiple Hardware Partitions with L3/EVB



- This is NOT true anymore, COT FE crates are in all DAQ EVB crates now
- Silicon and other people working at the same time with L3 is still possible

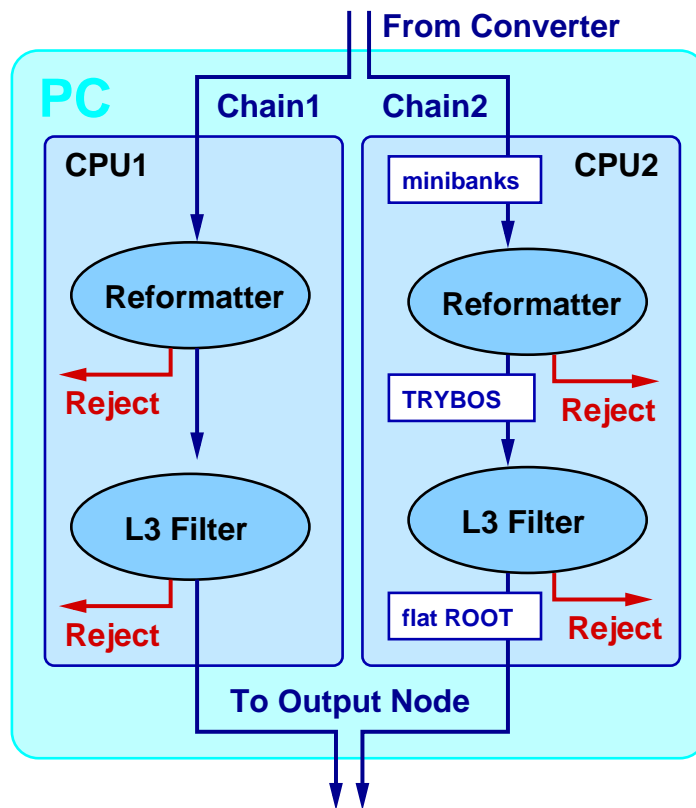
# L3 subfarm definition



## Functions:

1. Event fragments come to the Converter node from SCPUs
2. Converter combines fragments into one piece (raw event) and sends it to free Processor node in a subfarm
3. Processor PC rearranges event data to offline (TryBoss) format and applies L3 trigger. Passed events are written to the Output node
4. Output node forwards event to CSL

# Processor node details



Two analysis chains are independent and process different events.  
(Two boxes on Level3 Display)

Reformatter:

- Rearranges events to standard offline format
- Performs a number of data quality checks
- Discards corrupted events
- Generate Reformatter error if event is rejected

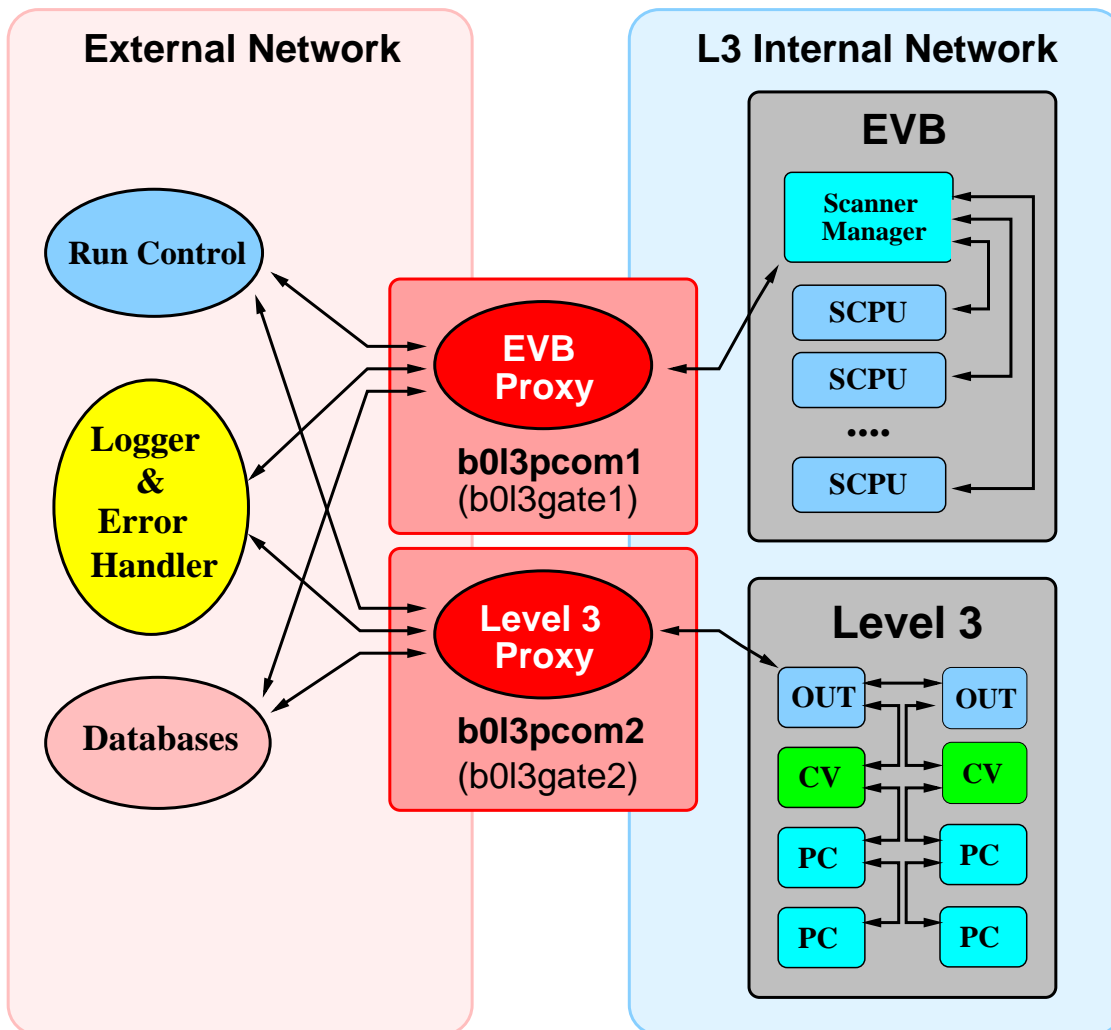
L3 Filter:

- Runs offline-type reconstruction
- Determines event type. Decides pass/fail
- Failed events are discarded

Events can be discarded by both Reformatter and L3 Filter!

Level 3 Filter executable is selected in Run Control GUI

# Gateways and proxies



- Connect RC and EVB/L3. Forward transition messages
- Transport error messages to RC Error Logger
- Transport monitoring information
- Both must be alive for the system to work

# Monitoring Tools

- EVB/L3 Ace Control Panel
  - Started with **EvbControl**
- L3 Display
  - On daqmon GUI select **L3**
  - setup fer; l3mon
- EVB Display
  - On daqmon GUI select **EVB**
- EVB health monitor (**NEW!**)
  - Check the fragment size and timing in the EVB crates
  - /mnt/autofs/cdf/people1/cdfdaq/scripts/evb-health

Others...

- Dead Time Display
  - On daqmon GUI select **Rates and Deadtimes**
- daqmon
  - Started with **setup fer; daqmon**
- Run Control
  - Started with **setup fer; rc**
- Error Handler
  - Started with Run Control

- Note: detailed instructions on EVB/L3 web pages

# RC parameters

☐ LoadEtlAlgo ☐ LoadEtlTable ☒ LoadDacs ☒ DacFromHdb

RunType: **Physics** TriggerType: **Physics\_0\_02 [2,212]**

SwSet: **(none)** CalorCalibSet: **(none)**

Output: ☐ Ethernet(SoftEvb) ☐ VRDQandEvb ☐ RunNumber ☐ DiagnosticBank ☐ ExtraDBanks

L1 Mode: ☐ Standard (Fred) ☐ Calib Fixed Period ☐ Calib External Trig ☐ Calib SVX ☒ Calib Continuous ☐ Software

L2 Mode: ☒ Auto L2 Accept ☐ Auto L2 ALT ☐ Auto L2 Reject ☐ L2 Processors

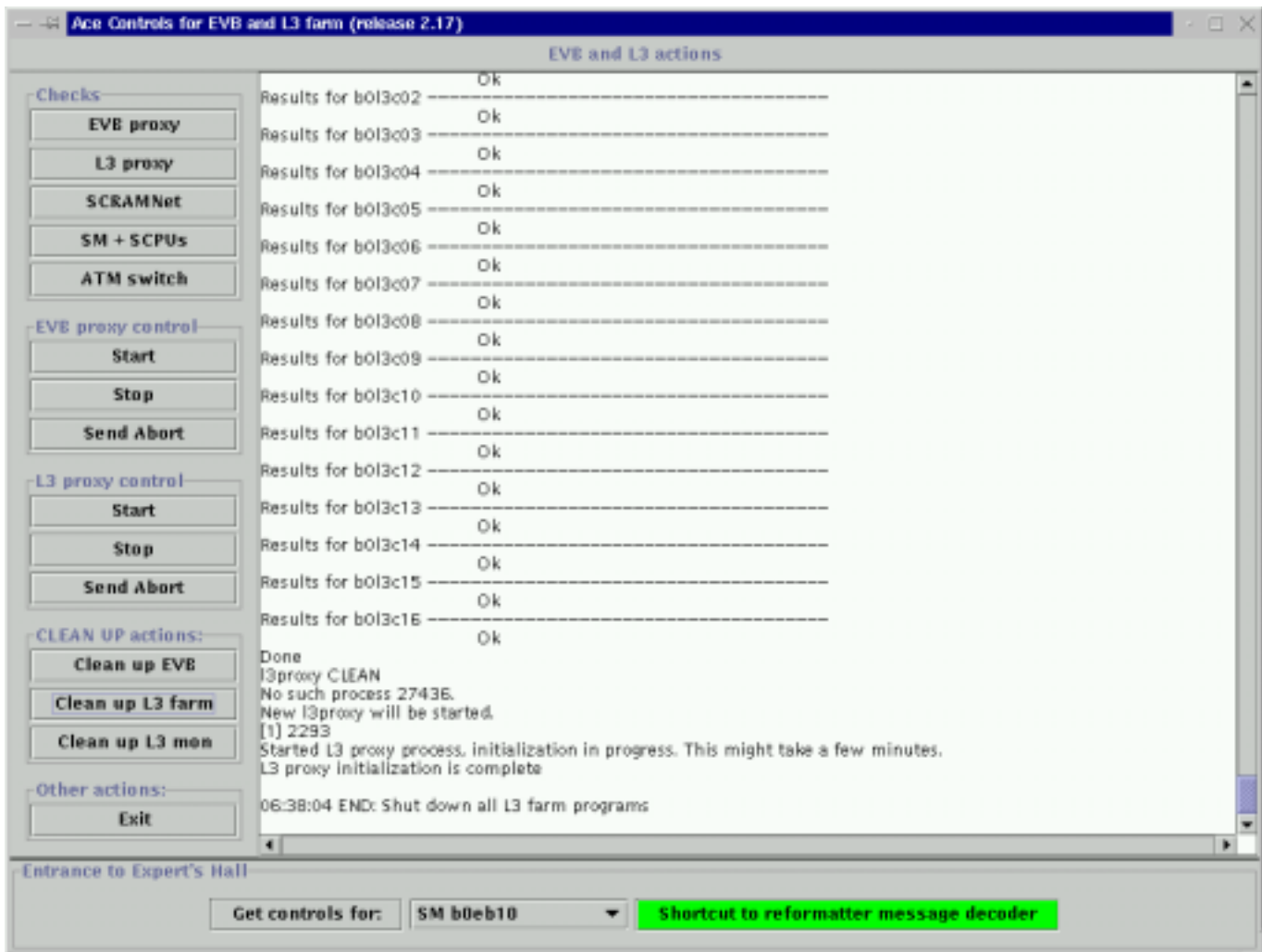
L3 SubFarms: ☐ All ☐ None

Output	0	1	2	3	4	5	6	7
0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Parameter	Value
L2AutoAccept	1
L3MaxProc	16
L3Output	1
L3SubFarmInput	0
L3SubFarmOutput	1
L3NumberOfCores	1
SpecialRunNumber	0
SwMode	
DropDelay 0	0.0

1. Include one, several or all Level3 subfarms
2. Include Hardware Event Builder
3. Choose Level3 tag
4. And more...

# EVB/L3 Ace Control Panel



- Check status of primary components
- Start, stop proxies and do full cleanup of EVB and L3
- Reset state of any partition (e.g., in case of RC crashes)
- Gives access to EVB Expert GUIs and [Reformatter Decoder](#)

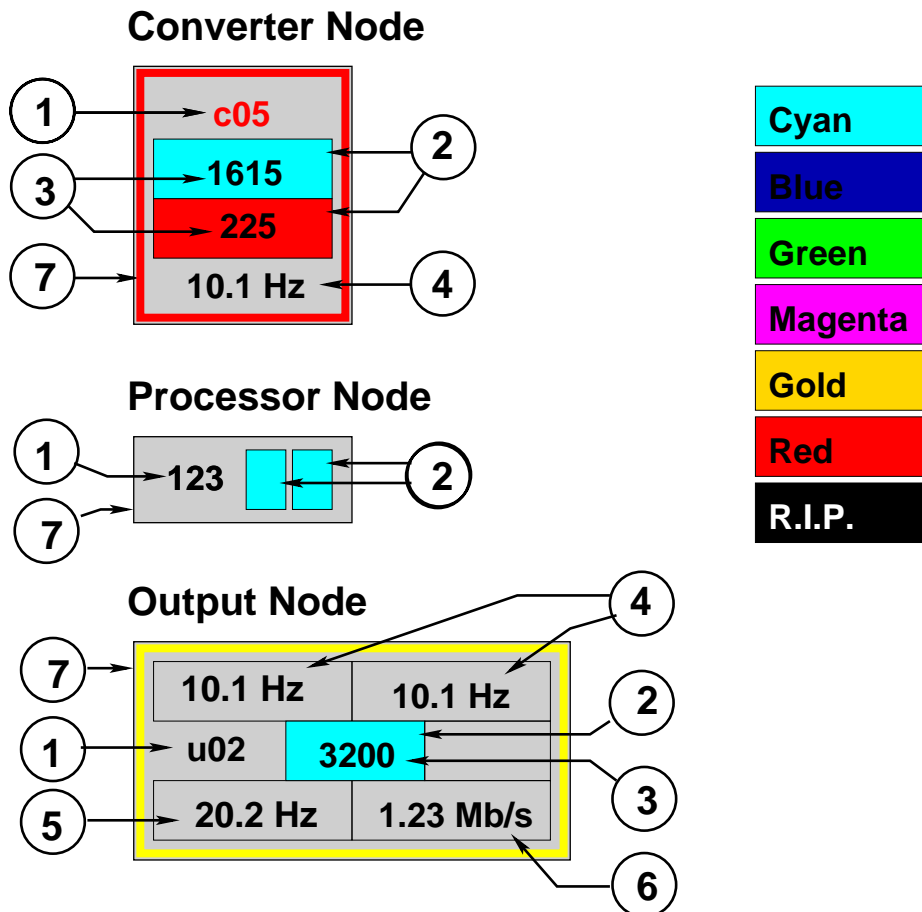
# Level3 Display



# Level3 Display



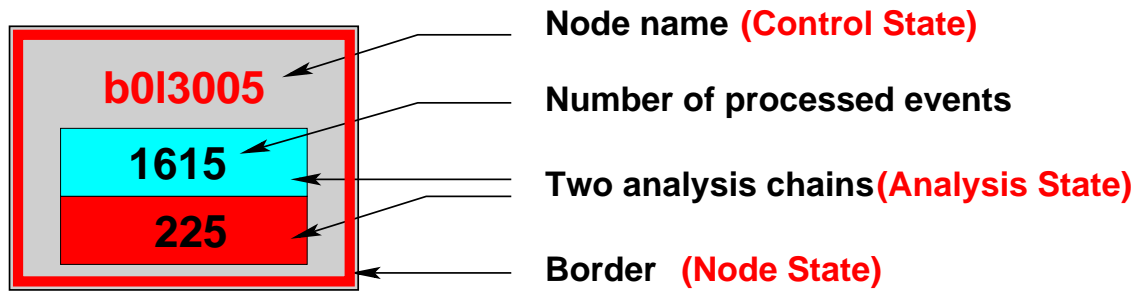
# Level3 Display



1. Node name. Color coded *Control* state
2. Color coded *Analysis Chain* state. Two per node
3. Number of processed events. (Converter and Output only)
4. Event rate for the subfarm. (Converter and Output only)
5. Output event rate for the Output node. (Output only)
6. Output data rate for the Output node
7. Border. Color coded *System* state

*Note:* To ensure the Display is being properly updated one may reset the window. (E.g., when a node appears magenta but nevertheless processing events.)

# Level3 Display



## Control State

- Error (red) - Level3 Errors (Click on the box to see Error messages)

## Analysis State

- Input (Cyan) - Waiting for input
- Busy (Dark Blue) - Chain is busy with event
- Output (Green) - Waiting for output
- End (Magenta) - Node ended the run
- Old (Gold) - Not updated. Probably monitoring failure
- Dead (Red) - L3 Filter crashed. All necessary procedures are done automatically at the end of run
- Unpingable (Black) - No connection to the node. If a node remains in this state for several minutes it is probably dead

## Node Hardware State

- Occasional yellow - Ok if not for the whole farm
- Permanent red - System/HW problem (Disk full, memory, etc.)

For color map check Level3 Display Help menu

## L3 Partition Monitor of L3 Display

	State/Transition	Phase #/out of #	Time spent
Partition 0:	In transition: End	Collect EoR summary: 2/3	00:00:13
Partition 1:	Not defined	In state: 1/1	00:00:13
Partition 2:	Not defined	In state: 1/1	00:00:13
Partition 3:	Not defined	In state: 1/1	00:00:13
Partition 4:	Not defined	In state: 1/1	00:00:13
Partition 5:	Not defined	In state: 1/1	00:00:13
Partition 6:	Not defined	In state: 1/1	00:00:13
Partition 7:	Not defined	In state: 1/1	00:00:13

Shows states and transitions of hardware partitions

### Things worth checking

- How many hardware partitions are running with Level3
- If bar **State/Transition** is yellow - Level3 received the RC transition message shown in the box
- If field **Time spent** is more than 5 min - Failure
- If all bars are red - Level3 Proxy is dead or L3 display lost connection. Check L3 Proxy from Ace Control Panel Reset/restart L3 Display or restart L3 Proxy depending on result

# Level3 Summary

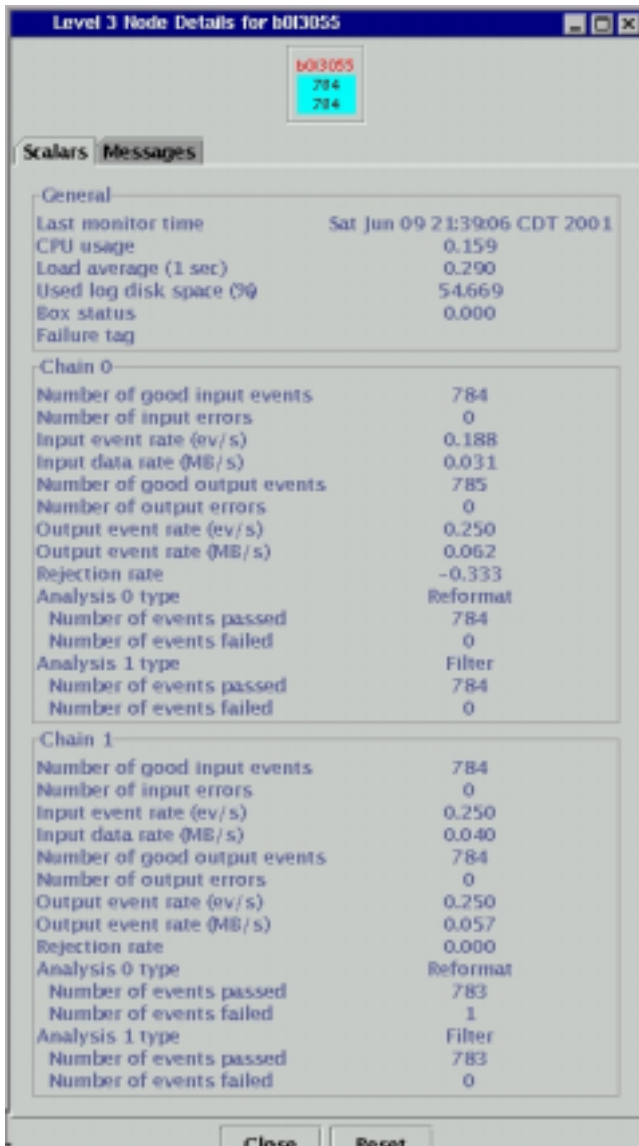
0	1	2	3	4	5	6	7
Level3 Summary							
	</						

Shows input output and rejection rates/events

## Things worth checking

- Input count and rate. Compare with RC number
- Reformatter rejection count and rate If higher than threshold ( $\sim 0.1\%$ ) decode reformatter error, identify failing component
- Filter rejection count and rate. If close to 100%,- do something (Noisy Level1 trigger?)
- Output count and rate. Compare with CSL rates
- Notice that each Level3 chain sends a "Begin Run" event to the output node at the end of ColdStart transition. Run begins with NON ZERO output event counter

## L3 Display: Node details

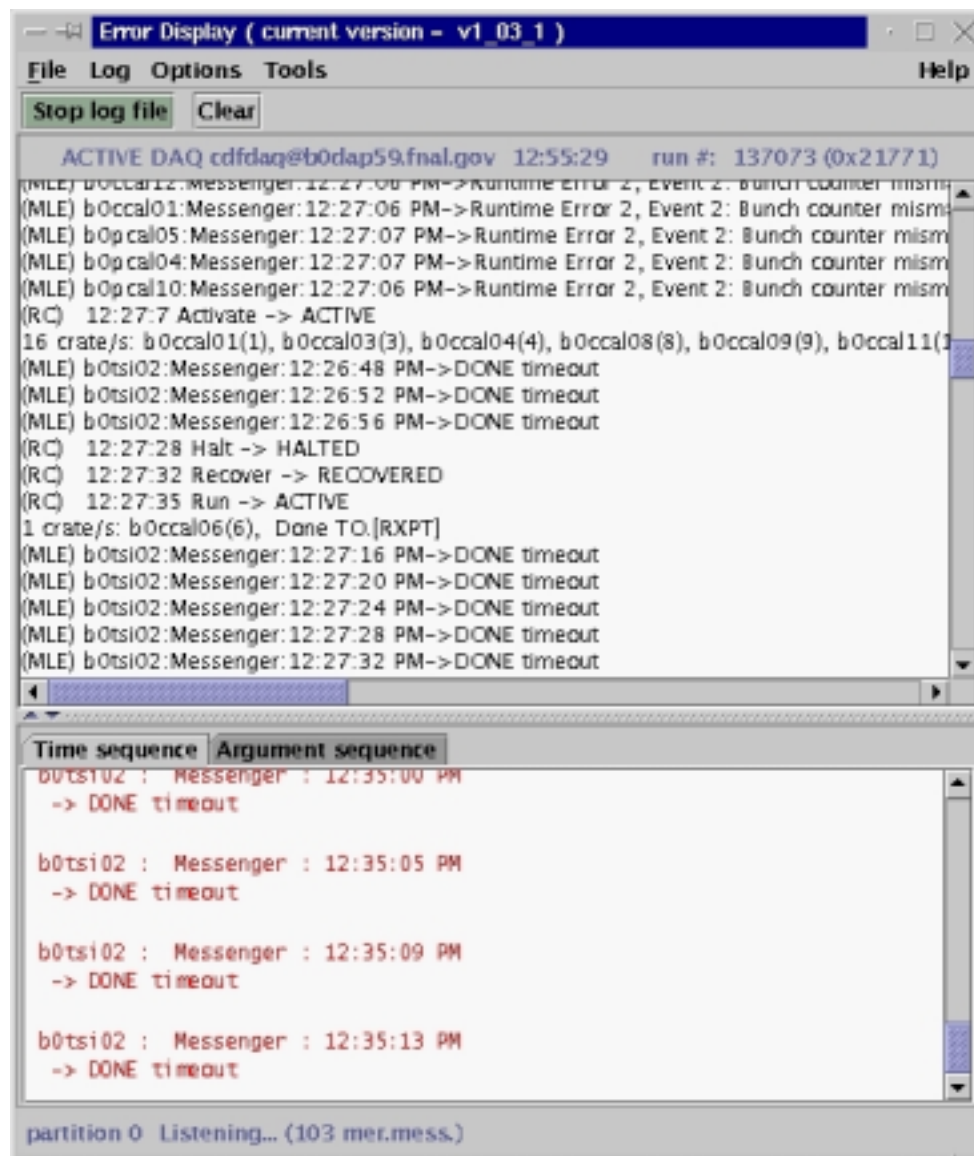


### Things worth checking

- Monitoring heartbeat.
- Events pass/fail for Reformatter and L3 Filter.
- Number of input/output errors. (for converters)
- Input/Output data/event rate. One can find the size of the event by dividing data rate to event rate.

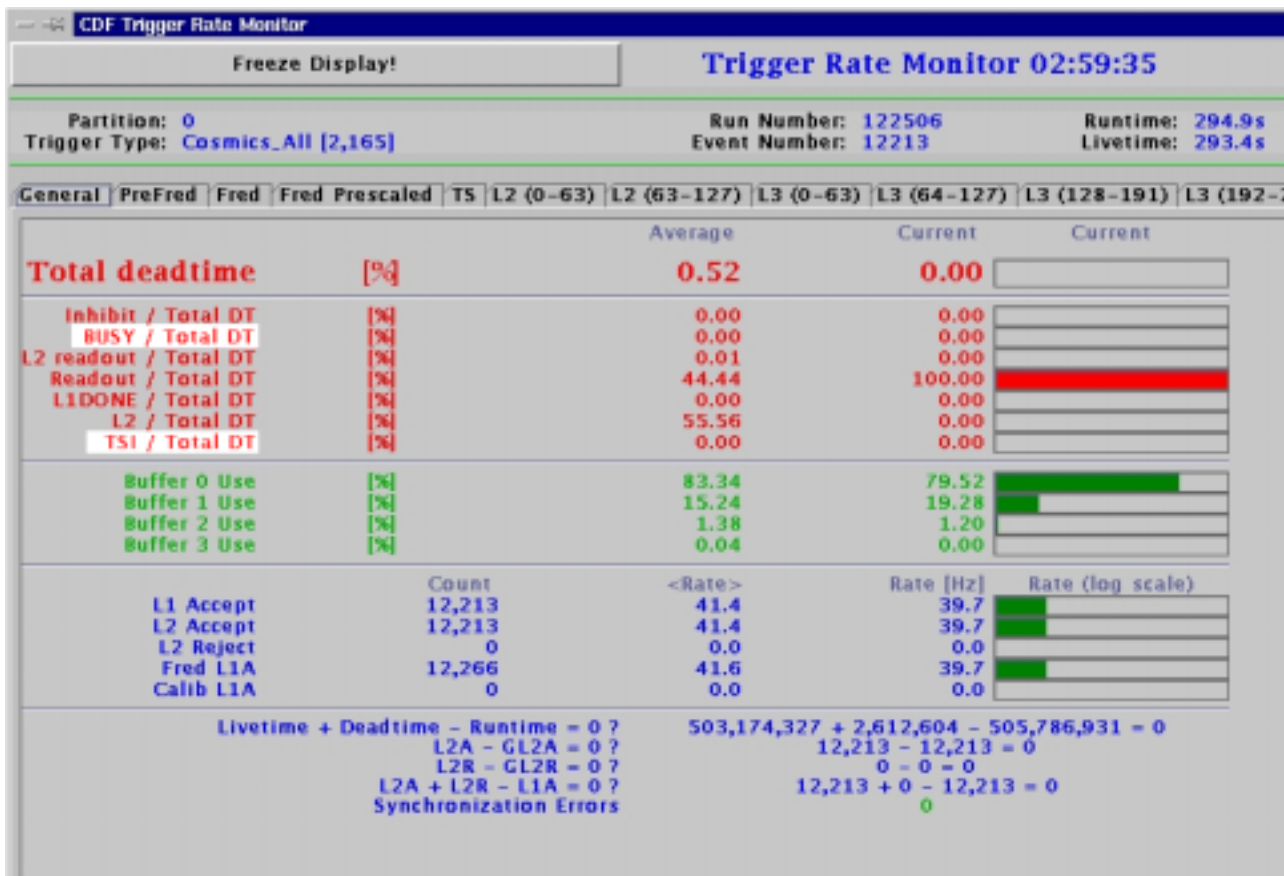
To open: click on any node of L3 Display

# Error Logger



Read the error messages in the RC Error Logger to try to identify the problem better

# Deadtime Monitor



**Inhibit** High voltage inhibit. Check HV monitor

**Busy:** - VRB is full. Check EvbMon for pending events Cleanup EVB if needed.

**L2 readout:** Problem between L2 decision crate and Trigger Supervisor. Reboot b0tsi00. Page TSI expert

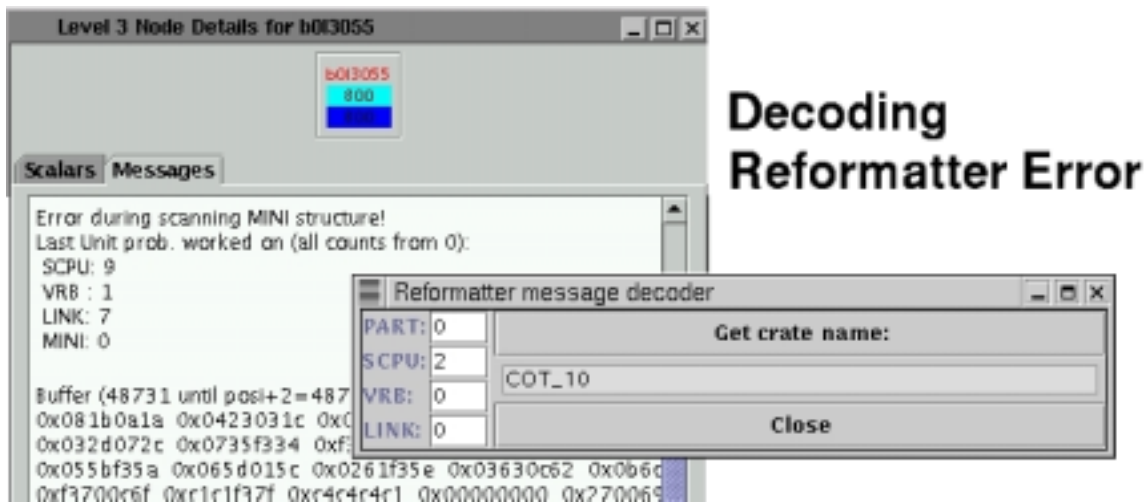
**Readout:** The time between FE crate receiving L2 trigger and set DONE signal is too long. Reboot the FE crate which causes the deadtime. Page expert

**L1DONE:** Silicon trigger problem. Page silicon

**L2:** Alpha board problem. Not enough processor power. Reboot Alpha board. Remove b0l2dec00 from run. Page L2 expert

**TSI:** - Interval0 (RC settings) is too big. EVB is too slow. Check EvbMon for pending events. Cleanup EVB if needed

# Dealing with Reformatter Errors



Find relevant FE component with a tool started by green button on Ace Control Panel

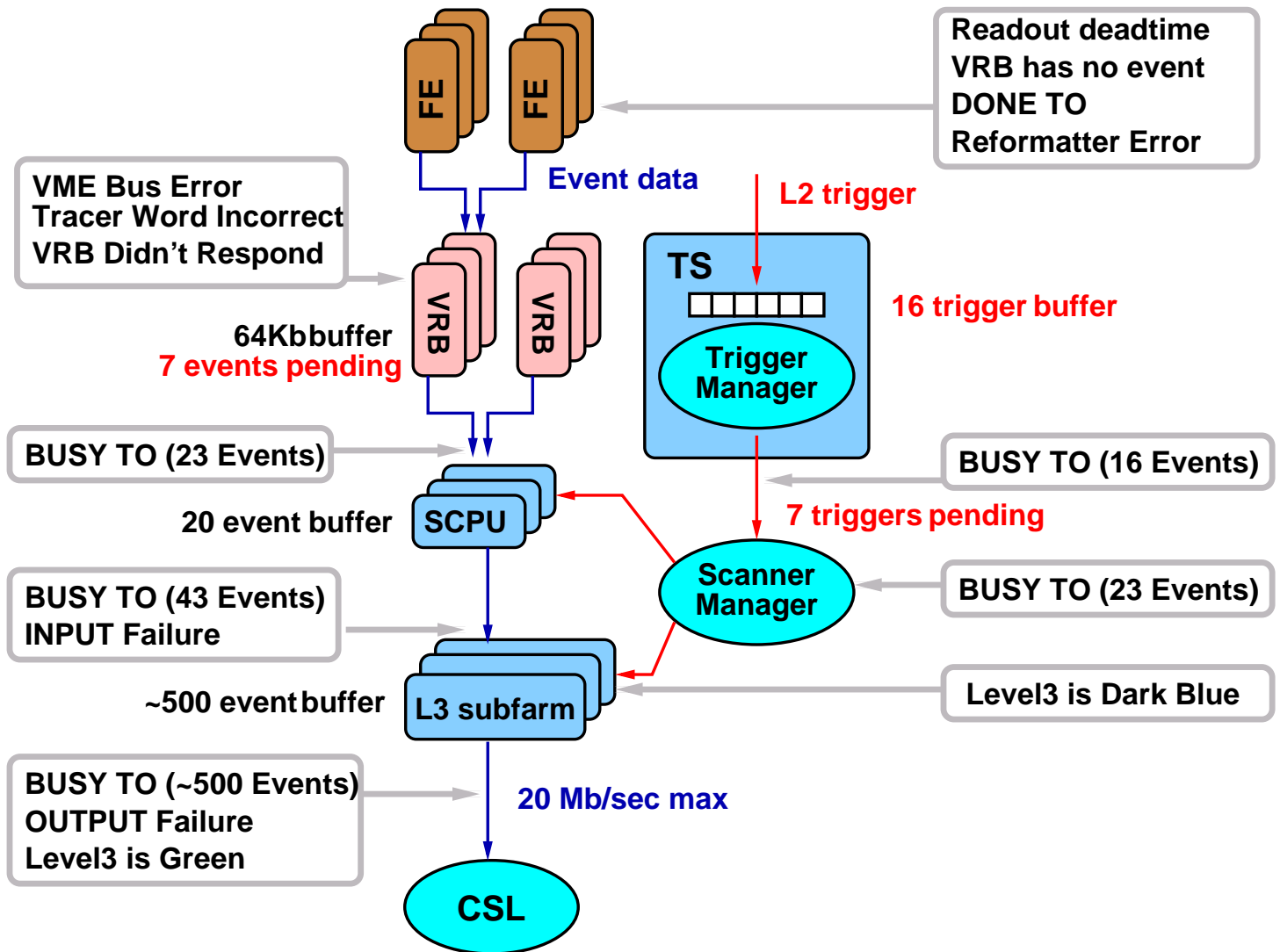
- You should be in Active or Idle state to use the tool
- If you can not start the tool restart Ace Control Panel
- **Server is not found** popup - try again, page Level3
- **Link is not in use** popup - Corrupted data can not provide us with correct link number. Change link number to 0 and try again

The reformatter rejection rate could be found on the L3 rate monitor (at bottom, right part of L3 Display)

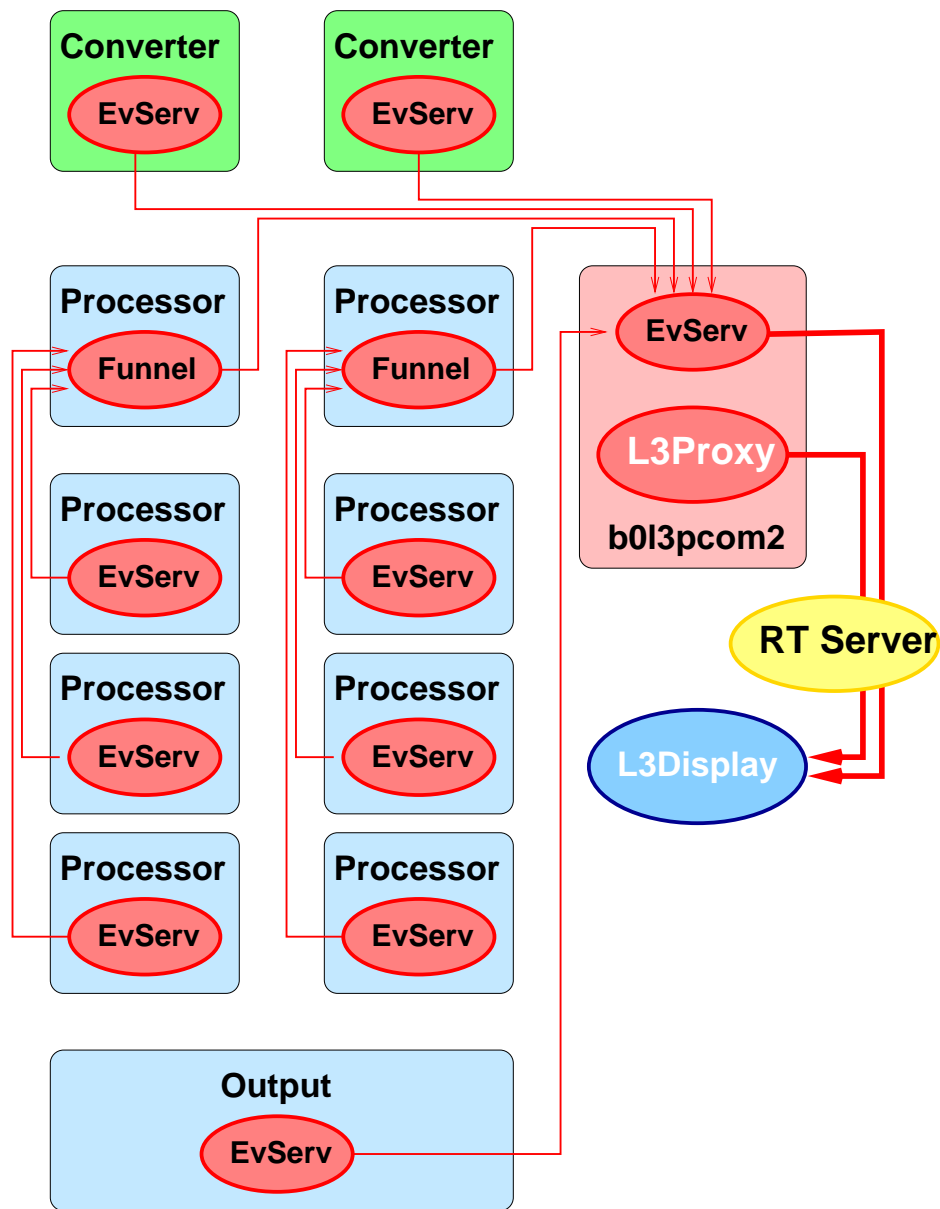
A tool is also running, RefMon, which calculates the rejection rates over the last 30 seconds; If rejection exceeds some predefined level RC pops up an orange window with instructions for the Aces

**Check L3 Rate Monitor for reformatter error rate**

# Networks, Buffers, Data Flow, Errors

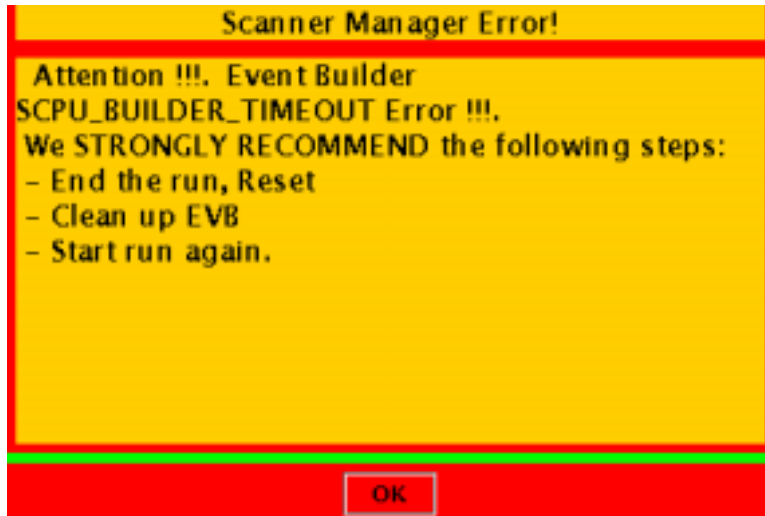


## Level3 monitoring data flow



- Eventserv - Accepts and sends monitoring messages
- Event Funnel - L3 wrap for Eventserv. Accumulate monitoring messages. Sends them in 4 second intervals

# General Remarks



- If you get an orange popup window with EVB/Level3 problem follow the instructions
- Check RC Error Display for error messages
- Any transition can not take more than 5 minutes. If it takes more it means a problem.
- **DONE timeout** (Readout deadtime). - Problem with FE
- **BUSY timeout** (Busy deadtime). - Problem with TS or EVB or L3 or CSL. (check Magic Numbers)
- Level3 is green - CSL problem (or output Switch problem)
- Level3 is gold - L3 monitoring problem
- You have to be in **START state** when cleaning up EVB and Level3 or restarting Proxies
- If you abnormally closed the partition you have to cleanup EVB
- Check white board for information on currently available subfarms

## Things to Keep an Eye on

- L3 Display Color
  - Green (Output State)- problem is downstream. Check if CSL is alive 20Mb/sec is max CSL input capacity
  - Gold (Old) - Monitoring problem. Cleanup L3 mon
  - Dark Blue (Busy State) - not enough process power (very rare, so far)
- Check if CSL is accepting events (read its monitoring tools)
- Check Rates and Dead time
- Check Reformatter rejection rate
- Look if Level3 proxy is alive
- Look if EVB proxy is alive

## Other minimum knowledge

- Understand general information on Level3 Display
- Be familiar with Ace Controls for Level3 and EVB
- Know the location of EVB components
- Understand Deadtimes Busy and Done timeouts
- Know how to deal with Reformatter errors

# Assistance

## Documentation

- Introduction for Aces, *CDF Note 5793* – please read.
- Manual for experts, *CDF Note 6138*
- Help pages,  
<http://www-cdfonline.fnal.gov/evbl3shift/evbl3shift.html>

*Note:* html versions of the notes are available on the help pages as well.

*Note:* EVB/L3 help pages are linked from the general Ace help page.

## Experts list

- Alberto Belloni ([pager](#))
- Arkadiy Bolshov ([pager](#))
- Boris Iyutin ([pager](#))
- Nuno Leonardo ([pager](#))
- Jeff Miles ([pager](#))
- Ilya Kravchenko
- Steve Tether
- Guillermo Gómez-Ceballos

*Note:* Pager and telephone numbers are posted in the Control Room and Ace web page. If pager does not respond (very rare), call other people!!!